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MICROBIOLOGICAL PROFILE OF BACTERIAL ISOLATES FROM CORNEAL ULCERS IN DOGS AND CATS TREATED AT A VETERINARY TEACHING HOSPITAL

PERFIL MICROBIOLÓGICO DE BACTÉRIAS ISOLADAS DE ÚLCERAS CORNEANAS EM CÃES E GATOS ATENDIDOS EM HOSPITAL VETERINÁRIO UNIVERSITÁRIO

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SUMMARY

The study aimed to characterize and evaluate the antimicrobial susceptibility profile of bacterial agents isolated from corneal ulcers in dogs and cats diagnosed with ulcerative keratitis treated at the Veterinary Teaching Hospital of the Federal University of Pelotas (HCV/UFPel). The study was conducted between November 20, 2022, and January 20, 2024, and included 19 dogs and 1 (one) cat with ulcerative keratitis presenting different degrees of severity. Following topical application of an ophthalmic anesthetic solution, 20 samples were collected from both healthy and ulcerated corneal surfaces using sterile swabs, which were subsequently placed in Stuart transport medium until laboratory processing. Bacterial isolation and characterization were performed, as well as antimicrobial susceptibility testing against drugs commonly used in veterinary ophthalmology. Bacterial growth was observed in 52.6% of canine samples, while no growth was detected in the feline sample. Among the isolates, 90% were Gram-positive and 10% Gram-negative bacteria, with *Staphylococcus* spp. (50%) being the most prevalent genus. Norfloxacin and chloramphenicol showed the highest efficacy against Gram-positive isolates. In the Gram-negative group, *Escherichia coli* was the only species identified and did not exhibit full susceptibility to any of the tested antimicrobials. Notably, bacterial resistance of up to 40% to amikacin was observed in both Gram positive and Gram-negative isolates. These findings emphasize the importance of microbiological identification and antimicrobial susceptibility testing for the rational selection of topical antimicrobial therapies in cases of ulcerative keratitis, aiming to improve therapeutic efficacy and reduce the risk of bacterial resistance.

KEY-WORDS: Veterinary ophthalmology. Ulcerative keratitis. Antimicrobial susceptibility.

RESUMO

O presente estudo visou caracterizar e avaliar o perfil de sensibilidade antimicrobiana dos agentes bacterianos isolados de úlceras de córnea em cães e gatos diagnosticados com ceratite ulcerativa atendidos no Hospital de Clínicas Veterinárias da Universidade Federal de Pelotas (HCV/UFPel). O estudo foi conduzido entre 20 de novembro de 2022 e 20 de janeiro de 2024, incluindo 19 cães e 1 (um) gato com ceratite ulcerativa em diferentes graus de acometimento. Após a aplicação tópica de solução anestésica oftálmica, foram coletadas 20 amostras da superfície de córneas hígidas e ulceradas, utilizando swabs estéreis, posteriormente acondicionados em meio de transporte Stuart até o processamento laboratorial. Realizou-se o isolamento e a caraterização bacteriana bem como a determinação do perfil de sensibilidade frente a antimicrobianos utilizados na oftalmologia veterinária. Observou-se crescimento bacteriano em 52,6% das amostras caninas, não sendo detectado crescimento na amostra felina. Dentre os isolados, 90% corresponderam a bactérias Gram-positivas e 10% a Gram-negativas, com predomínio de espécies do gênero *Staphylococcus* spp. (50%). Norfloxacina e cloranfenicol foram os antimicrobianos mais eficazes contra os isolados Gram-positivos. No grupo Gram negativo, *E. coli* foi a única espécie identificada, não apresentando suscetibilidade completa a nenhum dos antimicrobianos testados. Destaca-se ainda a resistência bacteriana de até 40% à amicacina, observada tanto em Gram-positivos quanto em Gram negativos. Os achados ressaltam a importância da identificação microbiológica e da determinação do perfil de sensibilidade para a seleção racional de terapias antimicrobianas tópicas em casos de ceratite ulcerativa, visando maior eficácia terapêutica e a redução do risco de resistência bacteriana.

PALAVRAS-CHAVE: Oftalmologia veterinária.Ceratite ulcerativa.Sensibilidade bacteriana.

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INTRODUCTION

Corneal ulcers are among the most frequent and painful ophthalmic conditions in dogs and cats and may rapidly progress to corneal perforation, vision loss, and even enucleation when not promptly diagnosed and treated (NUWANSHIKA et al., 2024; OLLIVIER, 2003). In both species, lesions range from superficial epithelial defects to deep stromal ulcers, descemetoceles, and keratomalacia ("melting ulcers"), often associated with secondary bacterial infection and intense proteolytic activity (NUWANSHIKA et al., 2024; ZUBRICKÝ et al., 2025). Typical clinical signs include blepharospasm, photophobia, epiphora, mucous or mucopurulent discharge, conjunctival hyperemia, and corneal edema; in severe cases, miosis, aqueous flare, hypopyon, and endophthalmitis may occur (MCKEEVER et al. 2021). The intense pain associated with corneal ulcers results from the dense corneal innervation, making ulcerative keratitis a major cause of ocular pain in small animals (CHECHNEVA & SKRYABIN, 2020; PATEL et al., 2020).

In cats, non-healing superficial ulcers and deep ulcers with descemetocele formation may be accompanied by variable corneal vascularization, stromal necrosis (corneal sequestration), and anterior synechiae with secondary glaucoma (ALI et al., 2021; FREJLICH & PAYEN, 2025). In dogs, complex ulcers—including deep stromal lesions, keratomalacia, descemetoceles, and corneal lacerations—are common in referral settings and frequently require surgical intervention such as conjunctival flaps or corneal grafts (NUWANSHIKA et al., 2024).

Diagnosis relies on a complete ophthalmic examination, including slit-lamp biomicroscopy, fluorescein staining to assess epithelial defects and ulcer depth, tear film evaluation (Schirmer tear test), tonometry, and neuro-ophthalmic assessment (FARGHALI et al., 2021; NUWANSHIKA et al., 2024). In rapidly progressive or stromal ulcers, corneal cytology, bacterial culture, and antimicrobial susceptibility testing are strongly recommended due to the high prevalence of *Staphylococcus* spp., *Streptococcus* spp., and *Pseudomonas* spp., including multidrug-resistant strains (VERDENIUS et al., 2023). Important differential diagnoses include non-ulcerative keratitis, feline corneal sequestration, keratoconjunctivitis sicca, immune-mediated keratitis, exposure keratopathy due to palpebral abnormalities or general anesthesia, and traumatic or neurogenic conditions that impair blinking or corneal sensitivity (FREJLICH & PAYEN, 2025).

In dogs, field studies suggest a higher incidence of corneal ulcers in young to middle-aged animals; however, referral-based analyses indicate increased risk with advancing age, particularly for chronic spontaneous epithelial defects and keratomalacia in older dogs (JAMES-JENKS et al., 2023). Brachycephalic conformation represents one of the most significant risk factors for corneal ulceration in dogs, with brachycephalic breeds showing a markedly increased likelihood of developing ulcers, especially complex and deep lesions (PACKER et al., 2015; JAMES-JENKS et al., 2023). Breeds such as Shih Tzu, Pug, Pekingese, and French Bulldog—characterized by wide palpebral fissures, nasal folds, and exposed sclera—may have up to a 20-fold increased risk compared with mesocephalic dogs (PACKER et al., 2015; KIM et al., 2019; JAMES-JENKS et al., 2023). In cats, infectious and severe ulcers are more common in young animals up to approximately one year of age, whereas trauma predominates across a wider age range (DEMÍR; SENSOY, 2023). Similarly, brachycephalic cats show a higher prevalence of ulcerative keratitis and corneal sequestration compared with normocephalic cats. Lesions are often central or paracentral and frequently associated with feline herpesvirus type 1 (FHV-1) as a primary etiological factor (FREJLICH & PAYEN, 2025).

Common etiologies of corneal ulceration include trauma (fighting, scratching, foreign bodies), palpebral conformational abnormalities (entropion, trichiasis, nasal folds), keratoconjunctivitis sicca, neurogenic diseases affecting the blink reflex, and bacterial or viral infections (NUWANSHIKA et al., 2024; FREJLICH & PAYEN, 2025). In cats, FHV-1 is a recurrent cause of non-healing superficial ulcers and deep corneal ulceration, potentially leading to perforation and endophthalmitis (ALI et al., 2021; DEMÍR; SENSOY, 2023).

The most frequently isolated bacteria in ulcerative keratitis include *Staphylococcus* spp., *Streptococcus* spp., *Pseudomonas aeruginosa*, *Escherichia coli*, *Corynebacterium* spp., and *Bacillus cereus* (HINDLEY et al., 2016). In dogs, melting ulcers are commonly associated with *Pseudomonas aeruginosa* or beta-hemolytic *Streptococcus*, often requiring aggressive therapy and surgical intervention, with higher rates of globe loss reported in *Pseudomonas* infections (TSVETANOVA et al., 2021). Therefore, ulcerative keratitis requires the prompt initiation of effective pharmacological treatment, with rational drug selection tailored to each individual case (GELATT, 2000). Identification of etiological agents through bacterial culture and antimicrobial susceptibility testing is essential for guiding appropriate therapy, preventing lesion progression, minimizing antimicrobial resistance, and reducing the risk of complications (GERDING et al., 1988; GALLE & MOORE, 2007). This approach is particularly relevant given that antimicrobial resistance constitutes a major concern for animal, human, and environmental health within the One Health framework (ARGUDÍN, 2017).

The objective of this study was to identify the most prevalent bacterial agents isolated from the cornea of dogs and a cat diagnosed with ulcerative keratitis, and to determine their antimicrobial susceptibility profiles against the drugs most frequently used in the routine ophthalmic care of the Veterinary Hospital at the Federal University of Pelotas.

MATERIAL ANDMETHODS

Ethics statement

All animal procedures were approved by the Ethics Committee for Animal Experimentation (CEEA) of the UFPel (protocol number 321.2017.90). The CEEA of the UFPel is accredited by the Brazilian National Council for Animal Experimentation Control (CONCEA). The animals were maintained in accordance with the CONCEA guidelines throughout the experiments.

Inclusion criteria and ophthalmic examination

A total of 19 dogs and 1 (one) cat, with no breed, age, or sex predilection, diagnosed with ulcerative keratitis (with or without associated pathologies), were included in the study. All animals were attended by the Companion Animal Medicine residents at the Veterinary Teaching Hospital of UFPel between November 2022 and January 2024.

In each animal, a complete ophthalmic examination was performed, including visual assessment, pupillary light reflex evaluation, slit-lamp biomicroscopy (Apramed® SLP Z), indirect ophthalmoscopy (Volk® 28D lens), tonometry (TonoVet Plus®), and Schirmer tear test I (Ophthalmic Diagnostic Strip®). The diagnosis of ulcerative keratitis was established using individually packaged sterile fluorescein-impregnated paper strips (Ophthalmic Diagnostic Strip®). The commercially available fluorescein eye drops (1% sodium fluorescein, Allergan®, Ireland) contain a preservative vehicle, thiomersal (NETTO and PEREIRA, 1998). Considering the potential inhibitory effect of this preservative on bacterial growth, the use of fluorescein-impregnated paper strips was preferred to avoid interference with microbiological results (Figure 1).

Corneal ulcers are classified according to the depth of tissue involvement as superficial ulcers, indolent or refractory ulcers, deep ulcers, descemetoceles, ulcers associated with keratomalacia (corneal melting), and corneal perforation, each presenting distinct clinical characteristics (WHITLEY, 2000).

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Sample collection

Following the diagnosis and routine ophthalmic examination, topical anesthetic eye drops containing proxymetacaine hydrochloride were instilled into the affected eye. Subsequently, sample collection for microbiological analysis was performed by swabbing the lesion on the affected eye using a sterile cotton-tipped applicator (swab) moistened with sterile saline solution, carefully avoiding contact with surrounding structures (Figure 1D). The swab was then placed in Stuart agar transport medium and transported to the Microbiology Section of the Regional Diagnostic Laboratory (LRD) at the Faculty of Veterinary Medicine, Federal University of Pelotas (UFPel). Although sample collection should ideally be performed prior to the initiation of antimicrobial therapy, this was not always possible, as in some cases the patient was already receiving medication.

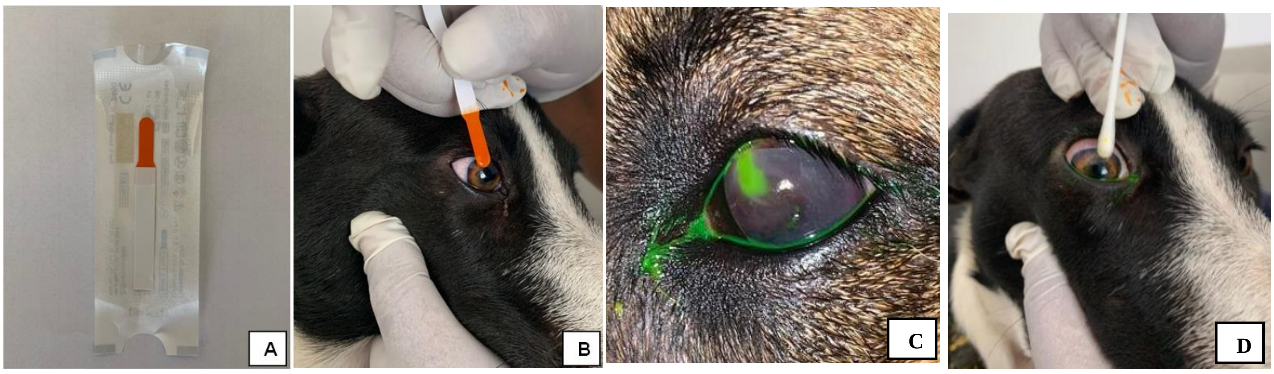

Figure 1- Fluorescein test used in the study. A – Fluorescein-impregnated paper strips (SynnVet®, Brazil). B – Fluorescein test being performed on a canine patient. C- Positive fluorescein test in a dog with superficial ulcerative keratitis. D - Sample collection from a corneal ulcer using a sterile swab.

Isolation and microbiological analysis

Samples were cultured in the microbiology laboratory on 5% sheep blood agar and MacConkey agar and incubated at 35–37 °C for up to 72 hours. After incubation, the grown colonies were subjected to biochemical tests for genus and species identification, as well as antimicrobial susceptibility testing.

Antimicrobial susceptibility was determined using the disk diffusion method, in accordance with the Clinical and Laboratory Standards Institute guidelines (CLSI, 2017). The antimicrobials tested were those commonly used in routine clinical practice for the treatment of ulcerative keratitis in small animals and available in ophthalmic formulations, including amikacin, tobramycin, ciprofloxacin, norfloxacin, and chloramphenicol. Data were subsequently recorded using Microsoft Office Word® and Microsoft Office Excel® for descriptive analysis.

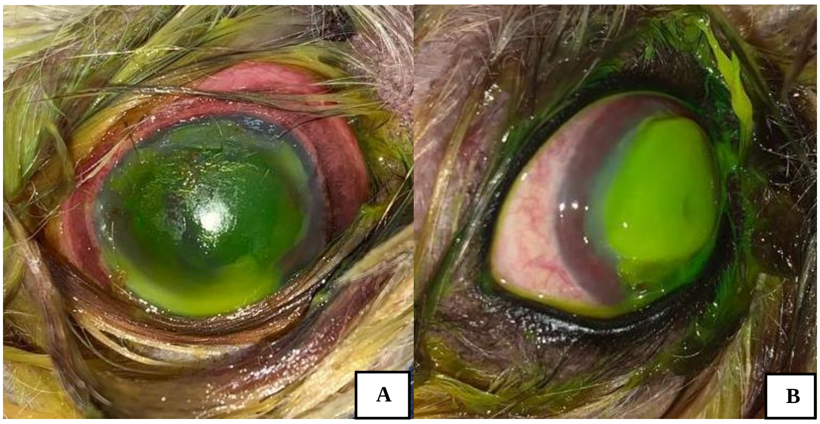

Figure 2 -Dog, male, Shih Tzu breed, 6 years old, diagnosed with ulcerative keratitis. A – Extensive, uncomplicated superficial ulcer. B – Negative progression to melting ulcer or keratomalacia, a complicated form.

RESULTS

At the end of the study, 20 corneal swab samples were collected, including 19 from dogs (95%) and 1 (one) from a cat (5%). Bacterial growth was observed in 7 samples (35%), whereas no growth was detected in 13 samples (65%). According to Table 1, mixed-breed dogs represented the majority of cases diagnosed with ulcerative keratitis, accounting for 60% (12/20) of the affected animals. Among purebred dogs, Shih Tzus were the most frequently affected breed, comprising 20% (4/20) of the cases. English Bulldogs and Pugs each represented 10% (2/20) of the cases. Overall, brachycephalic breeds (Shih Tzu, English Bulldog, and Pug) collectively accounted for 40% of the cases, highlighting a notable prevalence of ulcerative keratitis in this group.

Table 1- Breed prevalence in cases diagnosed with ulcerative keratitis at the Veterinary Clinical Hospital of UFPel, from November 2022 to January 2024.

Breed	**n (%)**
Mixed-breeddog	12 (60)
Shih-Tzu	4 (20)
English Bulldog	2 (10)
Pug	2 (10)
Total	**20 (100)**

According to Table 2, superficial corneal ulcers were the most frequently diagnosed type, accounting for 50% (10/20) of the cases. Indolent ulcers represented 20% (4/20) of the cases. Deep corneal ulcers were identified in 15% (3/20) of the animals, while descemetoceles accounted for 10% (2/20) of the diagnoses. Melting ulcers were the least common presentation, representing 5% (1/20) of the total cases.

Among the positive cultures (Table 3), most bacterial isolates were Gram-positive (90%), while Gram-negative bacteria accounted for 10% of the isolates. The most prevalent genus was *Staphylococcus* spp. (50%), followed by *Streptococcus* spp. (30%) and *Corynebacterium* spp. (10%). No bacterial growth was observed in the single feline sample. In six samples, a single microorganism was isolated, whereas two samples yielded two different microorganisms, resulting in a total of 10 bacterial isolates. Within the Gram-negative group, *Escherichia coli* was the only species identified, representing 10% of the isolates.

Table 2 -Classification of corneal ulcers diagnosed at the Veterinary Clinical Hospital of UFPel between November 2022 and January 2024.

Classification	**n (%)**
Superficial ulcer	10 (50)
Indolent ulcer	4 (20)
Deep ulcer	3 (15)
Descemetocoele	2 (10)
Melting ulcer	1 (5)
Total	**20 (100)**

Table 3- Prevalent bacteria from the corneas of dogs diagnosed with ulcerative keratitis, treated at the Veterinary Clinical Hospital of UFPel, from November 2022 to January 2024.

Bacteria	**Number of exultais/total**	**%**
GRAM-POSITIVE		
Staphylococcus spp.	5 / 10	50
Streptococcus spp.	3 / 10	30
Corynebacterium spp.	1 / 10	10
Subtotal	**9 / 10**	**90**
GRAM-NEGATIVE		
Escherichia coli	1 / 10	10
Subtotal	**1 / 10**	**10**
Total	**10**	**100%**

According to Table 4, the overall antimicrobial susceptibility profile of the Gram-positive bacteria isolated showed marked variability among the evaluated drugs. Chloramphenicol demonstrated the Best performance, with 70% (7/7) of the isolates classified as susceptible and no resistance detected, indicating high efficacy against Gram-positive bacteria in this study.

Table 4 - Overall antimicrobial susceptibility pattern of Gram-positive bacteria isolated from the corneas of dogs with ulcerative keratitis treated at the Veterinary Teaching Hospital of UFPel between November 2022 and January 2024.

	Gram-positive bacteria		
Antimicrobial drug	**S (%)**	**R (%)**	***n***
Amikacin	1 (10)	3 (30)	4
Tobramycin	4 (40)	3 (30)	7
Ciprofloxacin	4 (40)	2 (20)	6
Norfloxacin	5 (50)	-	5
Chloramphenicol	7 (70)	-	7

S= Susceptible; R= Resistant.

Norfloxacin also exhibited a favorable activity profile, with 50% (5/5) of the isolates being susceptible and no resistant isolates identified, although the number of tested samples was limited. Ciprofloxacin and tobramycin showed intermediate susceptibility rates, with 40% of the isolates classified as susceptible (4/6 and 4/7, respectively); however, relevant resistance rates were observed, particularly for tobramycin, which exhibited resistance in 30% of the isolates.

Amikacin showed the lowest susceptibility rate, being effective against only 10% (1/4) of the isolates, in addition to a resistance rate of 30% among the tested samples, suggesting limited empirical clinical usefulness against Gram-positive bacteria associated with canine ulcerative keratitis in this context.

DISCUSSION

Among the breeds evaluated in this study, a higher prevalence of mixed-breed animals was observed, followed by brachycephalic breeds such as Shih Tzu, Pug, and English Bulldog. The incidence of ulcerative keratitis in brachycephalic dogs is well documented in the literature and is attributed to their shallow orbital conformation and greater predisposition to ocular adnexal abnormalities, such as caruncular trichiasis, nasal fold trichiasis, and distichiasis. Additionally, tear film abnormalities, particularly keratoconjunctivitis sicca, are commonly reported in these breeds (GELATT & BROOKS, 2011; PACKER et al., 2015; JAMES-JENKS et al., 2023).

The predominance of superficial corneal ulcers observed in this study is consistent with previous reports, which describe these lesions as involving up to 50% of the stromal thickness and being associated with favorable clinical progression, rapid healing, and minimal scar formation (WHITLEY, 2000). The high frequency of this diagnosis suggests that a substantial proportion of the cases were identified at early stages, allowing timely therapeutic intervention and resulting in a more favorable prognosis. Superficial indolent ulcers also showed a relevant occurrence. According to Whitley (2000), these lesions are characterized by defects in epithelial adhesion, with the presence of loose and non-adherent epithelium, which explains their prolonged healing time and the frequent need for additional therapeutic approaches, such as corneal debridement or surgical intervention.

Deep corneal ulcers represented a considerable proportion of the cases, indicating loss of more than 50% of the corneal stroma and an increased risk of complications. Within this group, the occurrence of descemetoceles reflects advanced disease stages in which Descemet's membrane is exposed, corroborating previous descriptions of disease progression in inadequately treated deep corneal ulcers (WHITLEY, 2000).

Although less frequent, the identification of melting ulcers is clinically significant, as these lesions represent progression to keratomalacia, a severe complication associated with excessive protease and collagenase activity produced by microorganisms, inflammatory cells, and corneal cells (MCKEEVER et. al., 2021). The presence of such cases underscores the importance of early diagnosis and aggressive treatment of deep corneal ulcers to prevent progression to conditions associated with a guarded prognosis. Overall, the distribution of corneal ulcer types observed in this study aligns with existing literature, showing a predominance of superficial lesions while also highlighting the presence of severe ulcerative conditions that require complex therapeutic management and close clinical monitoring.

Regarding the limitations of this study, it was observed that 65% of the collected samples showed no bacterial growth. This finding may be attributed, at least in part, to the fact that some animals had already been receiving topical antibiotic therapy prescribed by another veterinarian prior to sample collection. Hindley et al. (2016), in a study evaluating the isolation of pathogens from the corneas of dogs and cats with ulcerative keratitis, also included patients undergoing previous antimicrobial treatment and reported 41% of negative cultures, highlighting the influence of prior antibiotic use on microbiological results.

In addition, the sampling method plays a significant role in the likelihood of obtaining positive cultures. Prado et al. (2006) demonstrated that corneal scraping using a spatula resulted in a 100% rate of positive cultures, indicating greater efficiency in recovering microorganisms from deeper corneal layers. In contrast, sterile swabs were used for corneal sample collection in the present study, which may have contributed to the lower bacterial recovery rate.

Nevertheless, previous studies have shown that corneal swab sampling can yield substantial rates of bacterial isolation in cases of ulcerative keratitis in dogs and cats. Reports describe positive culture rates ranging from approximately 50% to 70% when swabs were used, depending on factors such as sampling technique, type of swab, disease severity, and prior antimicrobial therapy (HINDLEY et al., 2016; MAGGS et al., 2015; BENTLEY et al., 2018). Therefore, the findings of the present study reinforce that both prior antimicrobial use and the sampling technique should be carefully considered when interpreting microbiological culture results and designing future studies.

Regarding the bacterial isolates, the findings of the present study are consistent with the available literature (TOLAR et al., 2006; WANG et al., 2008), demonstrating a predominance of Gram-positive bacteria, particularly those belonging to the genus *Staphylococcus* spp. Several studies conducted in different countries have likewise reported this genus as the most frequently isolated, with prevalence rates ranging from 33% to 58% (ARMSTRONG, 2000; TOLAR et al., 2006; WANG et al., 2008). Similarly, studies by HEWITT et al. (2020) and CASEMIRO et al. (2024) identified Gram-positive bacteria in 78% to 93.1% of ulcerative keratitis cases.

Variation in the frequency of isolation of specific bacterial genera and/or species may be attributed to multiple factors that influence microbial prevalence. These include climate and geographic location, seasonal variation, the animal's living environment, as well as the methodologies used for sample collection and culture (GALLE; MOORE, 2007). Although a global pattern of Gram-positive predominance is generally observed, intrinsic animal-related factors, particularly breed, age, sex, and housing conditions, also contribute to differences in ocular microbiota among animals from different countries and regions (PETERSEN-JONES; CRISPIN, 2008).

Despite the limited number of feline samples and the absence of bacterial growth in the single feline case evaluated, available data indicate that cats with stromal ulcers exhibit a microbiological profile similar to that observed in dogs. This finding supports the role of opportunistic pathogens from the normal ocular microbiota in the pathogenesis of feline ulcerative keratitis (VERDENIUS et al., 2023).

In this study, chloramphenicol was the most effective antimicrobial agent against the Gram-positive bacteria *Staphylococcus* spp. and *Streptococcus* spp., followed by norfloxacin. Both agents also demonstrated good activity against *E. coli* isolated from one patient, indicating their potential as effective treatment options for ulcerative keratitis in the study region. Similar findings were reported by HEWITT et al. (2020), who demonstrated that chloramphenicol showed an overall efficacy of 83%, with high susceptibility rates for *Staphylococcus* spp. and *Streptococcus* spp. (≥88%), although low activity against *Pseudomonas* spp. (20%).

Tobramycin and ciprofloxacin exhibited resistance rates ranging from 20% to 30% among the analyzed samples. These antibiotics are commonly prescribed as first line therapy for superficial corneal ulcers in dogs and cats due to their effectiveness and low toxicity (ÇAÇA et al., 2005). However, the indiscriminate use of antibacterial agents can lead to the development of bacterial resistance in both animals and humans, representing a public health concern, as highlighted by the World Organization for Animal Health (OIE, 2015). Overall, tobramycin continues to demonstrate good activity against many ocular bacterial pathogens in dogs and cats; however, clear reports of antimicrobial resistance have been documented, particularly among *Pseudomonas* spp. and multidrug-resistant staphylococci (PEREIRA et al., 2019; LEIGUE et al., 2016). With regard to ciprofloxacin, it is considered one of the most active antimicrobials, especially against *Pseudomonas aeruginosa* and several Gram-negative organisms, and it is also effective against a substantial proportion of Staphylococcus spp. (HEWITT et al., 2020). Nevertheless, an increasing trend of resistance has been reported, particularly among β-hemolytic *Streptococcus* and *Staphylococcus* spp., especially when ciprofloxacin is used as monotherapy (HINDLEY et al., 2016), reinforcing the need for culture- and susceptibility-guided antimicrobial selection.

According to the American Veterinary Medical Association (AVMA, 2020), veterinarians prescribing antibiotics responsibly should consider strategies to mitigate bacterial resistance. These include a thorough review of the animal's medical history, recent ineffective antibiotic treatments, analysis of prior diagnostic test results, and antimicrobial susceptibility testing (JESSEN et al., 2018). Culture and susceptibility test results can guide veterinarians in selecting appropriate treatments and support the monitoring of antimicrobial resistance (AVMA, 2020; MAPA, 2022).

CONCLUSION

The study demonstrated a predominance of Gram-positive bacteria in cases of ulcerative keratitis, with *Staphylococcus* spp. isolated in 50% of the samples. Chloramphenicol and norfloxacin showed the most effective activity against both Gram-positive and Gram-negative bacteria, indicating their potential as first-line antimicrobials for the initial treatment of ulcerative keratitis in dogs. Further studies are needed to support the rational use of antibiotics in veterinary ophthalmology within the study area, in order to guide more effective treatment strategies and help prevent bacterial resistance.

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